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Intelligent Railway Signaling System Based on Zigbee and Sensor Networks

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Abstract: **The proposed intelligent rail signaling signal is design based on ZigBee-based wireless sensors enable more efficient Railway signaling system. it is still one of the core parts in railway network in the aspect of ensuring train operation However, traditional railway signaling can not meet the requirements of modern train operation any more, Control and management are integrated in IRSS, based on necessary information system that is related to modern telecommunication system including mobile data communication,**

***Index Terms*—Automation, control system, Rail way signal system, sensors, wireless networks, ZigBee.**

1. INTRODUCTION

The global economic crisis that began in 2008 had an adverse impact on Egypt during FY09, as it reversed the favorable international environment which supported Egypt's growth in the last three years. Due to the crisis, real GDP growth was reduced to 4.7% in FY09 and unemployment increased to 9.4% from 8.4% a year earlier. However, this performance was better than expected as the slowdown was significantly less than in the developed economies or in other emerging markets with the exception of China. The Government of Egypt (GOE) implemented a crisis response plan featuring fiscal, monetary and direct support measures. Fiscal stimulus came in the form of additional spending of EGP15 billion (US$2.7 billion and 1.5% of GDP), including higher subsidies and social benefits (up by 2.1 points to 12.4% of GDP). There are signs that the worst is over as results for the first quarter of FY10 so far confirm the early beginning of a recovery with GDP growth at 4.9 percent.

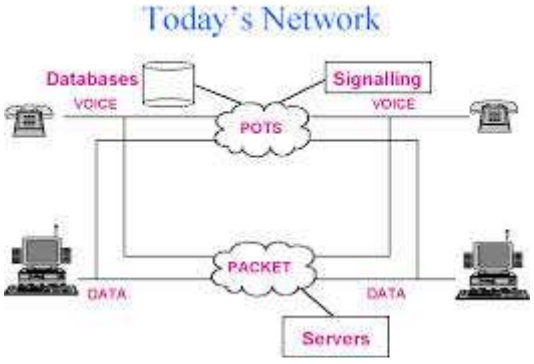

Fig.1. Today's Network

The crisis is an incentive for the Government of Egypt (GOE) to press ahead with economic reform. The broad mandate of the present Government is to improve living standards, promote investment, reduce unemployment, contain inflation, and improve the performance of administrative entities. To support its stated objectives and strengthen the business climate, the Government intends to develop well integrated and cost-effective transport systems through greater private sector involvement in the management and delivery of transport facilities and services.

Implementation

The implementation arrangements for the additional financing will be similar to those of ENRRP. ENR will serve as the implementing agency for both the ENRRP and the proposed additional financing, under the oversight of a Steering Committee comprising representatives of the Ministries of Transport, Finance, and International Cooperation. A Project Management Unit (PMU) was established within ENR to coordinate and implement ENRRP activities and to liaise with the Bank will. Chief among the PMU's tasks and responsibilities are:

- Ensuring the project is implemented within budget, on schedule, and according to technical specifications agreed upon at appraisal;
- Coordinating and supporting all procurement of works, goods and services, and ensuring all contracts financed by the loan are procured in accordance with Bank procurement guidelines;
- Establishing and maintaining an appropriate project financial management system and managing the project Special Account;
- Ensuring effective implementation of the environmental management plan; and
- Monitoring and evaluating project progress and reporting on project implementation and performance.

2. AUTOMATIC SIGNALING SYSTEM

Automatic Block Working is a system of train working in which movement of the trains is controlled by the automatic stop signals. These signals are operated automatically by the passage of trains ?into?, ?through? and ?out? of the automatic signalling sections. Following are the essentials of Automatic Block System.

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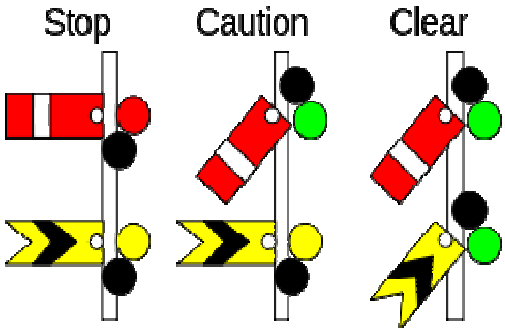

Fig.2. Automatic Blocking Sysytem

Where trains are worked on Automatic Block System: -
(a) The line is track circuited throughout its length and divided into a series of automatic signalling sections each of which is governed by an Automatic Stop Signal.
(b) The movement of trains is controlled by stop signals, which are operated automatically by the passage of trains past the signals.
(c) No Automatic Signal assumes 'OFF' unless the line is clear not only upto the stop signal ahead, but also an adequate distance beyond it.

Working of Automatic signalling is represented as under :

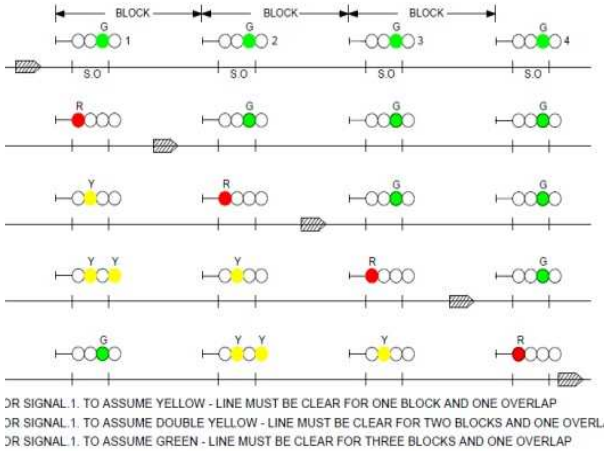

Fig.3. Automatic Signaling

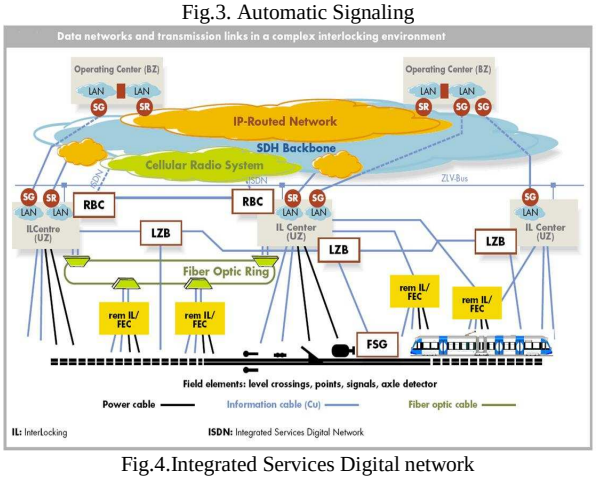

Fig.4.Integrated Services Digital network

Track circuit is one of the primary input for a signal interlocking plant. hold on. What is an 'interlocking plant'? It is the control logic behind the signaling system. The signal cannot be 'green' while there is another train on track segment ahead. The system should able to detect the condition of the track segment: occupied or not.
The tracks are segmented into 'blocks'. Each block is track circuited separately. The figure below illustrates a track circuit.

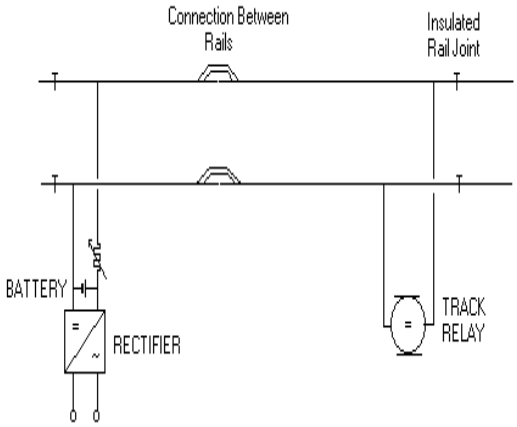

Fig.5.Track Circuit

The track circuit consists of a power supply on one end and a directional (polarized) relay on the other end. The power supply has a 6V battery kept charged by a 6V/6A rectifier. In case of power failure the battery will supply power to the circuit.
The track relay (TR), which has a resistance of 30 ohm and a pickup voltage of 1.4 volt, is normally held in picked-up state the circuit being completed via the rails. When a train enters the segment the axels of the train short circuit the supply to the relay and the relay drops. The contacts of the track relays appear in most of the safety circuits of the interlocking plant. The interlocking logic is arranged such that only one train can be permitted to enter a section. If you carefully observe, the track circuit is fail safe; if the circuit fails it will indicate occupancy.
The variable resister is introduced into the circuit such that it can be tuned to make the system works under all weather conditions.
The rails are insulated to separate the adjacent track circuits. The polarity of the adjacent track circuit is always reversed, so that the power supply of one circuit cannot operate the relay of the other circuit should the insulate between the circuits breakdown. Within one track circuit the rails are electrically connected by two wires (for safety).
The minimum length of track circuit is depends on the degree of control necessary and the maximum length is limited by the weather conditions. On the Northern line from Loco Junction (Maradana) to Veyangoda, the segments have a maximum length of 2000 feet. On the Southern line from Loco Junction

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to Wadduwa, due to the saline atmosphere along the cost line, the track circuits are limited to 1500 feet max.

Now that we have looked upon the track relay we will get into discuss the types of Relays used in the railway signaling.

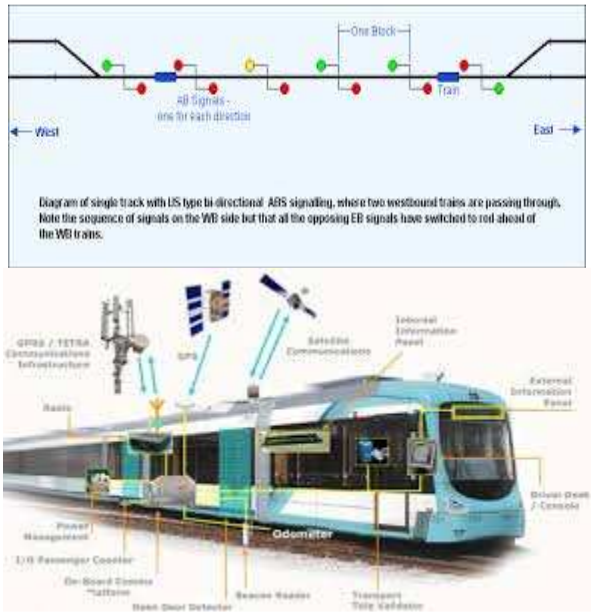

Fig.6. Signal Tracking

3. CONCLUSION

The advanced singling is very help full for railways to overcome many defects in design. This is possible with all embedding technologies in various fields. The wireless communication plays a very key role in rail way signaling.

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